Methods: Gradually occluding coronary stent was placed in the LAD to produce CDM in 49 pigs. Weekly 2D-echo studies postimplantation confirmed the progressive reduction in function in area "at-risk". At 4-5 weeks pre-sacrifice, the potential viability in "at-risk" segments was determined with DSE, followed by histomorphometric evaluation of the heart. Six animals served as controls.

Results: Of the 98 analyzed "at-risk" segments, 54 showed sustained improvement (SI), 18 biphasic (BR), 12 worsening (W) and 14 no change (NC) response.

	2D-Echo		Morphometry	Histomorphometry	
	Wall Thickening (%)	DSE Score	Coronary stenosis (%)	Tm-fib (%)	Tm-gly (%)
Control	46±4	1.0±0	-	0±0	0.8±1.9
SI	25±7	2.8±0.5	70±15	2.8±4.4	18.5±13.8†
BR	20±7	3.7±0.4	78±12	8.7±15.7	21.8±21.1†
W	11±8	3.9±0.2	88±9	35.8±25.3*	10.5±10.4
NC	4±5	4.9±0.2	95±4	50.9±15.5*	5.5±5.9

*p<0.05 vs Control, SI and BR.†p<0.05 vs Control and NC.

In area "at-risk" with increasing coronary stenosis severity stepwise histological changes were observed, from minimal increase in transmural (Tm) fibrosis, showing SI with DSE, to high degree of Tm-fibrosis, showing NC with DSE. A significant increase of myolysis with increased Tm-glycogen was observed in "at-risk" segments showing SI and BR with DSE.

Conclusions: Stepwise "functional dedifferentiation" (CDM and gradual loss of contractile reserve) was associated with histological "dedifferentiation" (increasing degree of interstitial fibrosis and myolysis).

MODERATED POSTER SESSION

1165MP Moderated Poster Session...New Echocardiographic Methods of Assessing Left Ventricular Function: Tissue Tracking Strain and Strain Rate Imaging

Tuesday, March 19, 2002, 9:00 a.m.-11:00 a.m.
Georgia World Congress Center, Hall G

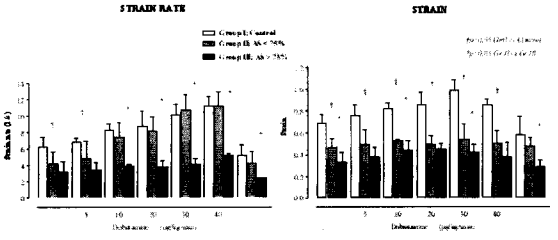
9:00 a.m.

1165MP-121 Dobutamine Stress Echo May Not Always Accurately Predict Segment Viability in Chronic Global LV Ischemia: An Experimental Study

Monika Szilard, Frank Weidemann, Xiaoshun Liu, Yanming Huang, Alex Maes, Jan D'Hooge, Bart Bijnens, Erik Verbeken, Luc Mortelmans, Frans Van De Werf, Ivan De Scheerder, George Sutherland, *University Hospital Gasthuisberg, KU Leuven, Leuven, Belgium.*

Provocative stress testing is a standard method used to detect potential segment viability in patients with chronic ischemic LV dysfunction. To quantify Dobutamine (DOB) induced changes in global ischemia and to determine whether a lack of response always means a segment is non-viable the following study was undertaken using ultrasonic strain rate (SR) and strain (S) imaging. Methods: Two occluding stents were placed in the Cx and LAD coronary arteries in a pig model (n=19) to produce chronic global LV ischemia. Weekly ultrasound studies postimplantation confirmed a progressive global reduction in LV function. At 4-5 weeks, a pre-sacrifice DSE was carried out. Maximal radial systolic SR and S were calculated off-line from posterior wall. Animals were divided in 3 groups: group I (n=6) controls, group II (n=7) with a Cx stenosis <75%, group III (n=12) with a Cx stenosis >75%. PET (n=9) and histology (n=19) was used to identify segment viability.

Results: In both diseased groups, after 4 weeks of follow-up, SR and S values were significantly lower than control values at rest. During incremental DOB, SR increased in controls and Gr II but not in Gr III. Conversely, S increased only in the normal animals.



The "at-risk" segment was viable using PET and histology. Conclusions: In severe chronic global ischemia there was neither SR or S response to DOB in the viable "at-risk" segment. This would suggest that the lack of response to DOB may not predict segment viability in clinical situations where global ischemia exists.

9:12 a.m.

1165MP-122 Reproducibility of New Tissue Doppler Parameters, Tissue Tracking and Strain, in Normals and in Patients With Acute Coronary Syndrome

Xiao-Fang Xu, Marcelo Carneiro, Jing Ping Sun, Lucia Coleman, Jill Odabashian, Zoran Popovic, Allan L. Klein, Neil Greenberg, James D. Thomas, *Department of Cardiovascular Medicine, Cleveland Clinic Foundation, Cleveland, Ohio.*

Background: Tissue tracking (TT) and strain (ε), derived from tissue Doppler, are parameters for quantitative assessment of regional myocardial function. However, limited data is available on reproducibility in normal and ischemic myocardium. **Methods**: 2D color DTI echocardiography (GE/Vingmed Vivid Five) were performed on 11 normal volunteers (41 ± 14 years old; 7 males) and 15 patients (71± 10 years old; 10 males) with unstable angina and non-Q myocardial infarction. Two independent observers (A and B) measured TT and systolic ε from the same apical four-chamber tissue Doppler images. Both inter- and intra-observer variability were analyzed and expressed as true difference ((A- B)/½(A+B), %, mean ± SD) and correlation coefficient (*r*). **Results**: Both bias and especially scatter (p<0.0001) were higher for ε *vs* TT. Median *r* was 0.99 (0.97 - 0.99) for TT, 0.74 (0.31 - 0.98) for ε (*p* = 0.0005). There was no systematic under/over estimation by one observer. The results is shown in table for basal septal and basal lateral segment.

		Inter-observer Variability		Intra-observer Variability	
		Tracking % (mean±SD)	Strain % (mean±SD)	Tracking % (mean±SD)	Strain % (mean±SD)
Normal (n=11)	Basal Septum	+0.3±2.3	+11.0±12.5	-0.9±3.5	+1.3±23.5
	Basal Lateral	-1.6±3.0	+5.2±22.9	-0.1±3.5	+5.6±21.8
USA/non-Q MI (n=15)	Basal Septum	-3.4±6.2	-8.4±32.2	+0.2±5.7	-3.2±66.3
	Basal Lateral	+3.3±8.2	-2.9±69.2	+2.3±11.1	+12.5±61.7

Conclusions: TT demonstrated excellent reproducibility for both normal and ischemic myocardium. However, significant inter- and intra-observer variability occurred in measurement of systolic strain, particularly in ischemic myocardium. Strategies to standardize size and location of region of interest may help to lower this variability.

9:24 a.m.

1165MP-123 Contribution of Myocardial Abnormalities, Loading, and Hypertrophy to LV Dysfunction in Hypertensive Patients: A Study of Ultrasound Tissue Characterization and Strain

Satoshi Yuda, Leanne Short, Rodel Leano, Thomas Marwick, *University of Queensland, Brisbane,QLD, Australia.*

Background. Abnormal LV filling is common but not universal in hypertensive left ventricular hypertrophy (LVH). We sought to elucidate the relative contribution of myocardial structural changes, loading and hypertrophy to LV dysfunction. **Methods.** We studied 113 patients; 85 (36 men, 58 ± 13 years) with hypertensive LVH (LV mass index >131 g/m^2 in men and >100 g/m^2 in women), and 28 controls (12 men, 55 ± 8 years) without LVH and with normal filling. Pts with normal dobutamine echocardiography and no history of coronary artery disease were selected in order to exclude a contribution from ischemia or scar. All pts underwent gray scale and color tissue Doppler imaging from 3 apical views, which were stored and analyzed off line. Integrated backscatter (IB) and strain rate (SR) imaging were used to detect changes in structure and function; average cyclic variation (CV) of IB, SR and peak systolic strain were calculated by averaging each segment. Calibrated IB intensity, corrected for pericardial IB intensity, was measured in the septum and posterior wall from the parasternal long axis view. **Results.** Abnormal LV filling (identified if the E wave deceleration time was >240 ms and/or ratio of early to late peak mitral annulus velocities <1.0) was present in 65 LVH patients. Pts with LVH significantly differed from controls with respect to all IB and strain parameters, irrespective of the presence or absence of abnormal LV filling. LVH pts with and without abnormal LV filling showed significant differences in CV (6.4 ± 1.0 vs 7.3 ± 1.1 dB; p < 0.01) and SR (-1.33 ± 0.20 vs -1.48 ± 0.27 1/s; p < 0.01). Pts had similar blood pressure, heart rate and LV systolic function, but pts with abnormal LV filling had greater LV mass index (174 ± 46 versus 135 ± 27 g/m2; p < 0.01).

Conclusions. Structural and functional abnormalities can be detected in hypertensive LVH patients with and without abnormal LV filling. In addition to LVH, these myocardial abnormalities are likely to contribute to abnormal LV filling, and may be an early sign of LV damage.

9:36 a.m.

1165MP-124 Assessment of Systolic Function in Left Ventricular Aneurysms by Strain Rate Imaging: Studies at Baseline and With Alteration of Function in a Chronic Animal Model

Rosemary A. Rusk, Julia C. Swanson-Birchill, Crispin H. Davies, Sebastian T. Schindera, Michael Jones, Antoinette Kenny, Xiaokui Li, David J. Sahn, *Oregon Health & Science University, Portland, Oregon, Freeman Hospital, Newcastle upon Tyne, United Kingdom.*

Background: Assessment of regional systolic function is an important determinant in the management of patients with coronary artery disease. This study compared strain rates (SR) in normal segments and those encompassed by the ischemic aneurysm in a chronic animal model with LAD occlusion. **Methods:** The left anterior descending coronary artery was occluded in 8 sheep (weight 35 - 47kg)19-27 weeks prior to the ultrasonic session. At follow up, color tissue Doppler imaging was performed using a 2.5MHz transducer epi-